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INDENTIFICATION OF ROOT-KNOT NEMATODE INFESTATIONS IN THE SELECTED AGRO ECOSYSTEMS OF TELANGANA STATE

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ABSTRACT

This study was carried out in the major cropping regions of the Telangana State for the Root-Knot Nematodes associated with the Economically Important crops. Soil sampling revealed that plant-parasitic nematode, Meloidogyne species was a major pathogen identified in the vegetable crops, commercial crops and fruit crops. Highest population of Root-Knot nematode was recorded in the tomato fields in our survey. In all the cropping regions, prominent disease symptoms were developed as gall formation in the root regions and poor plant growth resulting major yield loss to the farmers.

KEYWORDS: Plant – Parasitic Nematode, Root-Knot Nematode, Gall Formation & Meloidogyne Species

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Original Article

INTRODUCTION

Plant parasitic nematodes are identified as major agricultural pests and well known to infect plants causing major crop losses [Agris G.N. (2005)] throughout the World. Notably, the global annual losses to agriculture are estimated to be US $ 100 billion [Sasser & Freckman, 1987]. Root-Knot nematodes are amongst the most common genera of plant parasitic nematodes and constitute the major pest of crops all over the World. [Atkins et al., 2003, Perry et al., 2009].

Root-Knot nematodes are sedentary endoparasites [Crown & Dunn, 2009; Wang et al., 2009]. These nematodes parasitise a wide variety of crops amounting to more than 2000 plant species most of which are higher plants [Karsen & Meons, 2006; Moens et al., 2009].

Root-Knot nematodes complete several generations in one cropping season and interfere with water and nutrient uptake by the host plant. Hence, the present study was carried out to identify the Root-Knot nematodes problem faced on the cropping pattern.

METHODOLOGY

A Nematological survey was conducted in seven villages in Warangal district of Telangana State to assess the presence of Root-Knot nematodes distribution in economically important crops. Nearly, 120 soil samples were collected from surveyed villages. Randomly from of one are field. Soil sampling is done in the rhizosphere region at a depth of 10 – 20 cm and collected samples were stored at 10 – 15^{o}C to avoid the decay and drying of specimens. These samples were processed by Cobb's sleving and decanting method followed by modified Baermann's funnel method [Cobb, 1918]. These nematodes obtained were fixed in 4% formation and stored in a glass vials. Root fits were stained with acid-fuschinlactopherol and endoparasitic Root-Knotnematodes are

examined under microscope. Plant-parasitic nematodes can be easily differentiated from free-living saprophytic nematodes with the presence of stylet in the Head region. The nematode identification were mainly based on the morphology of Adults and Second stage Juveniles (J2) [Eisenback, 1985]. The fixed specimens were identified by making temporary mounts.

RESULTS AND DISCUSSIONS

Root-Knot nematodes were recorded in all the surveyed villages such as ChinnaPendyal, PeddaPendyal, Sangem, Unikicherla, Raghunathapally, Narsampet, Vardhannapeta associated with the crops such as tomato, brinjal, chilli, ladies finger, cotton, maize, rice,castor, pomegranate, turmeric and musk melon. These are specialized endoparasitic and lead parasitic mode of lives. The affected plant was impaired to adequately explore the soil for water and nutrients.

The nematode induced damage to plants was found aggravated in soils deficient in moisture and nutrients. The females of these nematodes are obese, sedentary and obligate endoparasites. Adult males and second stage Juveniles (J2) are vermiform and mobile. These Root-Knot nematodes caused extensive galling on roots. Young galls are white in colour and turned to brown and hardy when they become old. This is due to hypertrophy and hyperplasia of cortical cells of the roots and partly due to the formation of giant cells on which the nematodes feeds the gall formation resulted in the disturbance of the normal transport of nutrients to the shoot from the roots.

The Root-Knot infection reduced the efficiency of roots in uptake of water and nutrient from the soil. The most commonly associated symptoms observed ware stunting, small size of leaves and fruits with yellowing leaves in all the surveyed crops. The infected plants showed a tendency to wilt during the day. The Root-Knot nematodes normally predisposed the plant to the attack of fungal pathogens [Ex:-Fusarium, Phytophora, Rhizoetonia and Verticillum] further aggravating the damage. Root-Knot nematodes are the common major dominant species in almost all the economically important crops. Recently John Sudheer et al., 2007 have studied the biodiversity of plant-parastic nematodes in selected districts of Andhra Pradesh.

The intensity of Root-Knot nematode damage increased with the increase in the age of the plant. Extensive root galling was observed in tomato cultivation in our survey. Highest population of females egg masses were observed inside and also outside the galls as shown in the figures 1-5.

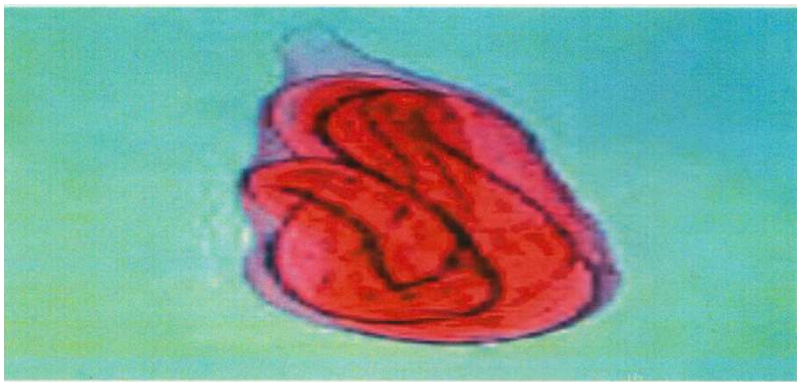

Figure 1: *Meloidogyne* Male Still Coiled within the J4 Cuticle

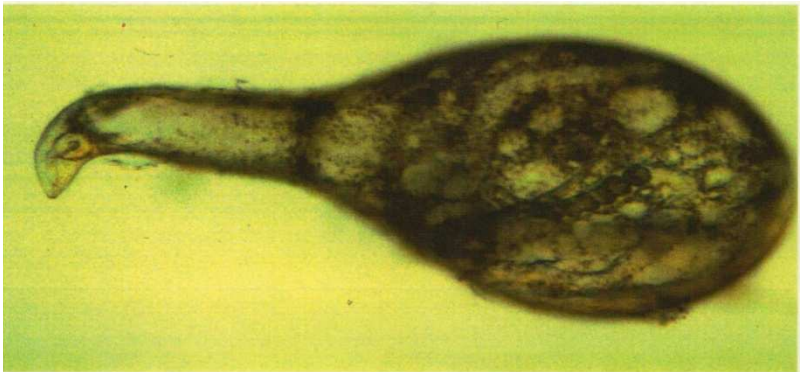

Figure 2: *Meloidogyne* (Root – Knot Nematode) Female

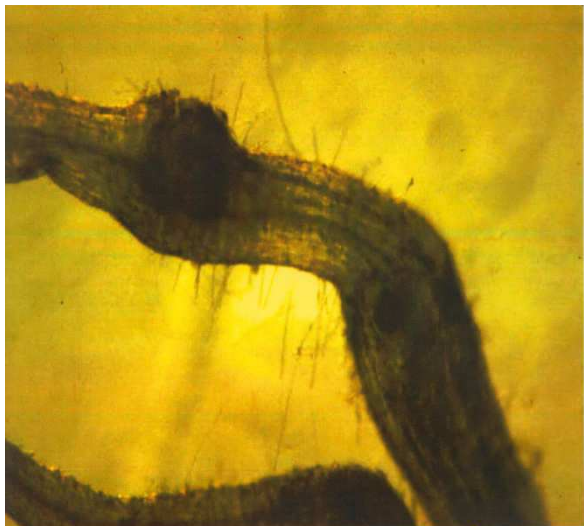

Figure 3: Roots Infested with Root-Knot Nematodes usually have Visible Galls

Figure 4: A Field Showing Infested Plants on Right, Un-Infested Plants on the Left

Figure 5: Roots of Severely Attacked (Left) and Healthy Plant (Right)

Table 1: Showing the Samples Collected in Economically Important Crops and % of Root-Knot Nematode Infected Soil of Warangal District

Crops	No. of Samples Collected	Samples +ve for Root-Knot Nematode	% of Root-Knot Nematode Infested Soils
Tomato	13	12	92
Brinjal	12	10	83
Chilli	12	08	66
Ladies Finger	13	10	76
Cotton	10	05	50
Turmeric	09	04	44
Rice	11	06	54
Maize	10	06	60
Caston	08	03	38
Pomegranate	12	06	50
Musk Melon	10	05	50
Total	**120**	**75**	

The soil type has profound effect on the nematode reproduction facing greatest in coarsely textured sandy soils and least in more finely textured soils. The soils of Warangal District are mostly Red soil and Black-Cotton soils with sand loam textured. Therefore, soil type, moisture and temperature enhance the degree of Root-Knot nematode infestation and population size.

CONCLUSIONS

The present study clearly identified the presence of Root-Knot nematode in the major cropping soils of Warangal District causing pathogenic symptoms and current threat to the crop production. The strategies for the management of these Root-Knot nematode should be devised and hence the control benefits improve the quality and quantity of crop production and improves the health of plants. Therefore, lowers the susceptibility of pathogens and promotes the plants to with land unfavorable condition with better exploitation of nutrients and moisture.

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REFERENCES

1. *Agrios, G.N. 2005. Plant diseases caused by Nematodes. In: Plant Pathology, Agrios, G.N. (Ed.). Elsevier Academic Press Ltd., London pp. 608.*
2. *Atkins, S.D., Hidalog-Diaz, L., Kalisz, H., Mauchline, T.H., Hirsh, P.R. & Kerry, B.R. (2003).Development of new strategy for control of Root-Knot nematodes (Meloidogyne.Spp.)in organic vegetable production. Pest Management Science 59, 183-189.*
3. *Cobb, N.A. 1920. Estimating the nematode population of the soil.Agric.Tech Bur. P1. Ind. US. Dept. of Agric. No. 1: 19-24.*
4. *Cobb, N.A., 1918, Estimating the nematode population of soil. United States, Department of Agriculture Technical Circular 1: 1-48.*
5. *Crow, W.T. & Dunn, R.A. (2009).Managing nematodes for the non-commercial vegetable garden.*
6. *Eisenback, J.D. (1985). In: An advanced Treatise on Meloidogyne, Vol 1: Biology and control, Eds. SasserJ.n. and Carter, C.C., North Carolina State University, Raleigh. USA: 95-112 pp.*
7. *John Sudheeer, M., P. Kailaiarasan, M. Senthamaria. 2007. A New report of Root-Knot Nematode, Meloidogyne incognita on Pomegranate, puniagranatum from Andhra Pradesh Indian Journal of Nematalogy. 37(2): 201.*
8. *John Sudheer, M., Senthamarai, M., &Kalaiarasan, P. (2005). Biodiversity of plant parasitic nematodes in selected districts of Andhra Pradesh, National Symposium on Recent Advances and Research Priorities in Indian Nematology, 9-10 December 2005: 29pp.*
9. *Karssen, G &Moens, M. (2006).Root-Knot nematodes. In: Perry, R.N. & Moens, M. (Eds). Plant Nematology. Wallingford CAB International, pp. 59-90.*
10. *Moens, M., Perry, R.N. & Starr, J.L (2009).Meloidogyne species – a diverse novel group and important plant parasites. In: Perry, R.N., Moens, M. & Starr, J.L. (Eds). Root-Knot nematodes. Wallingford, UK, CAB International, pp. 1-17.*
11. *Perry, R.N., Moens, M. & Starr, J.L. (209).Root-Knot Nematodes.Wallingford, UK, CAB International.*
12. *Sasser, J.N. and Freckman, D.W., 1987. A World perspective on nematology: the role of the society. In: Vistas on nematology. (eds. J.A. Veechand and D.W. Dickson). Society of Nematologists, Hyattsville, Maryland, USA. Pp. 7-14.*
13. *Want, C., Lower, S., Williamson, V.M. (2009). Application of pluronic gel to the study of Root-Knot nematode behavior. Nematology 11, 453-464.*